References of Sievert Consult and its associates

(Mizan Consult FZE, Blumberg-engineers)

REED BED TREATMENT SYSTEMS (CONSTRUCTED WETLANDS) IN THE MIDDLE EAST

U.A.E., Iran, Oman, Jordan, Qatar

Wastewater treatment plant

Mahshahr, Iran

Owner:
Petrochemical
Special Economic Zone
Persian gulf region,
Islamic Republic of Iran

Consultant:
Blumberg engineers

Treatment of domestic waste water from a worker camp

Person equivalent:
4,000 PE

Planning: 02/2002 – 10/2002
Construction: 01/2003 – 06/2004

Pretreatment:
- Screen, pumping station
- Sedimentation tank
- Separate sludge silo
- Distribution by vacuum siphon

Effluent parameters (2008):
COD < 30mg/l
BOD_5 < 18 mg/l
NH_4-N < 5 mg/l
TSS < 3 mg/l

Secondary treatment:
- Vertical subsurface flow constructed wetland
- 8 reed beds
- Two-stage system

Discharge:
- Reuse for irrigation

Gross space requirement:
- 9,000 m²

Special features:
- Temperature up to 45°C

Labor Camp
Mirfa, Abu Dhabi, U.A.E.

Client :
Waagner Biro Gulf

Contractor :
Waagner Biro Gulf (with support for planning, design, construction supervision, start-up and operation by Mizan Consult)


Installation of dams

Treatment of raw waste water, for reuse as irrigation water.

Population equivalent:
80 PE

Planning: 04/2011
Construction: 05-07/2011

Pre-treatment:
- Macerator pump station
- Sludge Filtration & Mineralization Reed Bed (2 basins, vertical flow)

Biological treatment step :
- Reed Bed, vertical flow (1 basin, vertical flow)

Outlet:
- 20 m³ of treated water per day.
- Direct reuse of the water for: irrigation

Space requirement:
- 400 m²


Spray nozzles test Stage B


Reed Bed treatment system after 6 months of operation

	COD	BOD	NH4-N	PO4-P	TDS	TSS	DO	Turbidity	pH
	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	NTU	
Raw sewage, Inflow	383	279	45.4	5.53	357	129			7.65
Reed Bed Stage B, TSE*	<12	< 5	0.2	0.02	933	< 10			7.8
ADSSC/RSB-Standard P1	-	10	-	-	-	10	1	5	6 - 8
ADSSC/RSB-Standard P3	-	50	2	2	-	50	>3	75	6 - 9

*Treated sewage effluent

Savannah Lodge, Sir Bani Yas Island, Abu Dhabi, U.A.E.

Client :
TDIC

Contractor :
Hilalco

Main Consultant:
Parsons with specialised reed bed sub-consultant Mizan Consult for design, construction supervision, start-up and operation

Population equivalent:
90 PE

Planning: 2010
Construction: 04-10/2011

Pre-treatment:
- Macerator pump station
- Sludge Filtration & Mineralization Reed Bed (2 basins, vertical flow)

Biological treatment step :
- Reed Bed, vertical flow (2 basins, vertical flow)

Outlet:
- 18 m³ of treated water per day.
- Direct reuse of the water for: irrigation

Space requirement:
- 1100 m²


Excavation of basins


Casting pump station


Sand filling of basins


Basins after 3 months

Anantara Hotel, Sir Bani Yas Island, Abu Dhabi, U.A.E.

Client :
TDIC

Contractor :
Hilalco
Waagner Biro Gulf (RBC team)

Main Consultant:
Parsons with specialised reed bed sub-consultant Mizan Consult for design, construction supervision, start-up and operation

Population equivalent:
Phase 1: 300 PE
Phase 2: 1200 PE

Planning: 2010
Construction: 04-10/2011

Pre-treatment:
- Tanker discharge station
- Manual bar screen
- Macerator pump station
- Sludge Filtration & Mineralization
  Reed Bed Stage A
  (4 basins, vertical flow, 4 x 248 m²)

Biological treatment step :
- Reed Bed, vertical flow
  (4 basins, vertical flow, 4 x 360 m²)

Outlet:
- 62.5 m³ of treated water per day.
- Direct reuse of the water for:
  Irrigation

Space requirement total:
- 8000 m²

Contract value: 16 Mio AED


Excavation of pump station


Pump station


Earth basins


First TSE discharge

	COD	BOD	NH4-N	PO4-P	TDS	TSS	DO	Turbidity	pH
	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	NTU	
Inflow	86	91	22.6	2,27		55	2	24.6	7.55
TSE*	28.5	10	nd	0.355		3.5	7.46	1.53	7.75
ADSSC P1	-	10	-	-	-	10	>1	5	6 - 8
ADSSC P3	-	50	2	2	-	50	>3	75	6 - 9

*Treated sewage effluent

Labor Camp
Sila, Abu Dhabi, U.A.E.

Client :
Waagner Biro Gulf

Contractor :
Waagner Biro Gulf (with support for planning, design, construction supervision and start-up by Mizan Consult)

Treatment of complete waste water for reuse as irrigation water.

Population equivalent:
200 PE
Planning: 07/2011
Construction: 08/2011 - 04-2012

Pre-treatment:
- Macerator pump station
- Sludge Filtration & Mineralization Reed Bed (2 basins, vertical flow, 260 m²)

Biological treatment step :
- Reed Bed, vertical flow (1 basin, vertical flow, 340 m²)

Stage A, after planting reed

Outlet:
- 40 m³ of treated water per day.
- Direct reuse of the water for: irrigation

Space requirement:
- 800 m²

	BOD	NH4-N	PO4-P	TDS	TSS	DO	Turbidity
	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	NTU
Raw Inflow	148	48.7	8.8	364	50		
TSE*	2	0.13	2.1	1324	<5		
ADSSC P1	10	-	-	-	10	1	5
ADSSC P3	50	2	2	-	50	>3	7

*Treated sewage effluent

Labour camp, Al Sifa, Oman

Client :
Muriya Tourism Development Oman

Contractor :
Bauer Oman (with support for planning, design, construction supervision, start-up and operation by Mizan Consult engineer)


Earth works

Population equivalent :
100 PE, 14 m³/day

Planning:09/2009
Construction: 11-12/2009

Sewage treatment:
Raw sewage reed bed

- Cutter pump station
- Vertical filtration reed bed
- Horizontal biological reed bed
- Storage tank, tanker filling

Sewage sludge treatment :
Directly in filtration reed bed


Basins after planting

Outlet:
- Storage and reuse for construction

Advantages:
- No sewage storage & discharge
- Green technology for the project
- Production of fertilizer

Space requirement:
- 1400 m²


Basins after 1 year of operation

	COD	BOD	NH4-N	NO3-N	TDS	TSS	pH
	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	
Raw sewage	910	330	62	-	1000	680	7.3
Reed Bed 1 OUT	20	8	22	5	1150	52	7.8
Reed Bed 2 OUT, FINAL	18	7	1.6	6	1200	7	7.9

After 1 year of operation

Sewage sludge mineralization, Resort Zighybay, Oman

Client :
Six Senses Resort Zighy Bay

Contractor :
Bauer Emirates Environment (with support for planning, design, construction supervision, start-up and operation by Mizan Consult)


Filter layer

Population equivalent :
1400 PE


Planting


After 6 month of operation, view from the private hotel beach

Wetland roof, Dubai, U.A.E.

Client :
Dubai Municipality

Contractor :
Waagner Biro Gulf (with support for planning and design by Mizan Consult engineer)

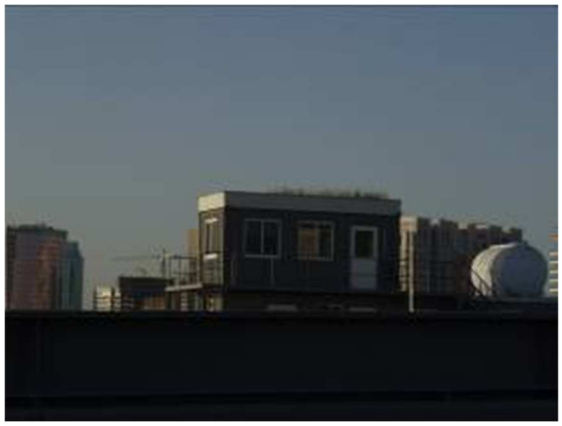

Container before installation

Population equivalent:
4 PE

Planning: 10/2007
Construction: 12/2007

Pre-treatment:
No pre-treatment
- only grinder pump station

Biological treatment step:
- within the layer of a green roof


Container with wetland roof after planting

Outlet:
- No outlet
- Direct reuse of the wastewater for roof top irrigation

Advantages:
- No septic tank
- No sewer connection
- Direct reuse of wastewater
- No contact of people with sewage
- Cooling of container by irrigated green roof

Space requirement:
- 15 m²


Container after 3 years of operation

Grey-water treatment Labour camp Al Awir, Dubai, U.A.E.

Client :
Waagner Biro Gulf

Contractor :
Waagner Biro Gulf (with support for planning , design, construction and operation by Mizan Consult)

Treatment of grey-water
(Showers, washbasins)
at a labour camp.

Population equivalent:
250 PE

Planning: 12/2005
Construction: 01-03/2005

Pre-treatment:
- Settlement tanks
- Pumping station

Biological treatment step :
- vertical subsurface flow constructed wetlands

Outlet:

25 m³ of blended water per day.

- Direct reuse of the water for:

Irrigation
Road watering
Car washing
..Fish pond

Space requirement:
- 450 m²


Filling of filter material


Reed Bed after 1 year of operation


Reed bed and fish pond with treated water

	COD	BOD	TKN	NO_3-N	NH_4-N	PO_4-P	TDS	TSS	CL	SO_4	Salinity	pH
	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[‰]	
Septic tank IN	162	67	2.1	1	3.6	7.0	314	47				7.1
Reed Bed IN	131	18			6.7	8.2	257	36				7.1
Reed Bed OUT	10.5	2.0	2.5	2.6	0.7	4.8	420	0	113.5	45	0.4	7.7

Site camp, Lagoons, Dubai U.A.E.

Client :
Wade Adams

Contractor :
Waagner Biro Gulf (with support for planning and design by Mizan Consult)

Treatment of wastewater
from a site camp.


Filling of filter material

Population equivalent:
200 PE

Planning: 03/2006
Construction: 03/2006

Pre-treatment:
- Septic tanks
- Pumping station

New planted reed

Biological treatment step :
- constructed wetlands (vertical flow)

Outlet:

6 m³ of treated water per day.

- Direct reuse of the water for:

irrigation

Space requirement:
- 150 m²


After 2 months of operation

	COD	BOD	TKN	NH_4-N	PO_4-P	TSS	pH
	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	
Septic IN	400	193			9	186	6.9
Septic Out	301	114			8	70	7.0
Reed Bed OUT	16	3	2.8	0.2	1.8	0	7.4

Drilling Camp, Abu Butabul, Oman

Client:
British Gas

Contractor:
Bauer Emirates Environment (with support for design, construction supervision, start-up and operation by Mizan Consult)


Reed bed 1. stage, under construction

Capacity:
200 population equivalent
35 m³/d

Pre-treatment:
- Raw sewage lift station with grinder

Biological treatment step :
- 2 vertical flow constructed wetlands for suspended solids removal and organic load reduction
- 2 horizontal flow constructed wetlands for biological treatment


Reeds after 8 months of operation (08-2008)

Outlet:
- Storage pond and direct reuse for irrigation

Sludge treatment:
- Sewage sludge mineralization (primary sludge) at first treatment step


Reed Beds after 2 years operation (01-2010)

Area requirement:
- 1,800 m²

Operating costs
Power consumption
5 kWh/d
Amount of composted sludge:
10 m³/year
Period of sludge removal
20 years
Maintenance staff: 0,03 skilled worker

	COD	BOD	NH4-N	TDS	TSS	pH	FC
	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]		/100ml
Reed Bed 2 out, final effluent	30	5	<0.1	2,000 – 8,800	< 5	7.9	Not detected

Sewage sludge mineralisation reed bed Al Salt, Jordan

Client :
KfW, Waj Jordan

Contractor :
Bauer Emirates Environment (with support for design, construction-supervision and start-up by Mizan Consult)


Filter layer installation

Capacity:
8 m³/day surplus sludge (2.5 %DS)

Planning: 05/2011
Construction: 07-10/2011


Sludge bed 2 months under operation

Sewage treatment:
Extended aeration

- Aeration basin
- Settling tanks
- Multimedia filtration

Sewage sludge treatment :
- sludge mineralization reed beds (vertical flow)


Sludge bed 7 months under operation (Oct.- Mai)

Outlet:
- Sludge liquor is pumped back to STP

Advantages:
- No sludge storage & discharge
- Production of fertilizer

Space requirement:
- 640 m²

Al Hamra Housing Project, Ras Al Khaimah, U.A.E.

Client :
Ministry of Public Works

Contractor :
First Gulf Line (Main)
RBC, Reed Bed Contracting L.L.C.

Main Consultant:
KN-International (with support by Mizan Consult)
Population equivalent:
Phase 1: 100 villas, 800 PE, 216 m³/day

Planning: 2012-2013
Construction: 04/2014-04/2015

Pre-treatment:
- Tanker discharge station
- Manual bar screen
- Macerator pump station

- Sludge Filtration & Mineralization
  Reed Bed Stage A
  (4 basins, vertical flow, 4 x 675 m²)

Biological treatment step :
- Drainage pump station
- Reed Beds, vertical flow
  (4 basins, vertical flow, 4 x 900 m²)

Outlet:
- 150-200 m³ of treated water per day.
- Direct reuse of the water for:
  Irrigation & Tanker filling

Space requirement total:
- 12.000 m²

Contract value:
- 4 Mio AED (RBC), total 16 Mio AED


Start of excavation and filling


Pump station


Drainage system

	COD	BOD	NH4-N	PO4-P	TDS	TSS	DO	Turbidity
	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	NTU
Inflow	446	175	33.4	11.6		308		386
TSE	22	7	0.99	0.35		<5		0.33
ADSSC P1	-	10	-	-	-	10	>1	5

Al Haray Housing Project,
Fujeirah, U.A.E.

Client :
Ministry of Public Works

Contractor :
Dar AlWd
RBC, Reed Bed Contracting L.L.C.

Main Consultant:
KN-International (with support for design, construction supervision and operation by Mizan Consult)
Population equivalent:
Phase 1: 132 villas, 880 PE, 316 m³/day

Planning: 2012-2013
Construction: 2013-2014

Pre-treatment:
- Tanker discharge station
- Manual bar screen
- Macerator pump station

- Sludge Filtration & Mineralization
  Reed beds Stage A
  (4 basins, vertical flow, 4 x 1000 m²)

Biological treatment step :
- Drainage pump station
- Reed beds, vertical flow
  (4 basins, vertical flow, 4 x 1325 m²)

Outlet:
- 220-316 m³ of treated water per day.
- Direct reuse of the water for:
  Irrigation & Tanker filling

Space requirement total:
- 15.000 m²

Contract value:
- 7 Mio AED (RBC), total 25 Mio AED


Start of excavation and filling


Liner installation


Drainage system

	COD	BOD	NH4-N	PO4-P	TDS	TSS	DO	Turbidity
	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	NTU
Inflow	260	105	37.8	12.2		138		93.2
TSE	31	9	1.15	0.23		6		2.71
ADSSC P1	-	10	-	-	-	10	>1	5
ADSSC P3	-	50	2	2	-	50	>3	75

Doha North STP TSE Lagoon, Qatar

Client :
Ashgal Infrastructure Works, Qatar

Contractor :
Keppel Seghers, Waagner Biro Gulf (RBC team)

Main Consultant:
KEO, Stanley Consultants (with support for design, construction supervision and operation by Mizan Consult)

Data of lagoon:
- *Deep pond: 8,753 m²*
- *Shallow pond: 5,064 m²*
- *Reed planted wetland area 18,821 m²*
- *Walkway 568 m²*
- *Gazebo 3 Nr.*
- *Circulation pump: 600 l/s,*
- Total Storage volume: 18.000 m³

Planning: 2012
Construction: 2012-2015

Treatment of lagoon water:
- Gravel filled reed planted wetland area
- Drainage water collection system
- Recirculation pump

Space requirement total:
- 33.000 m²

Contract value:
- 7 Mio AED


Liner installation

Drainage system and gravel filter


Wetland area, fresh planted

Al Haray Housing Project, Fujeirah, U.A.E.

Client :
Ministry of Public Works

Contractor :
DarAlWd

Main Consultant:
KN-International (with support for design by Mizan Consult engineer)
Population equivalent:
Phase 2: 198 villas, 1584 PE, 576 m³/day

Planning: 2014-2015
Construction: 2015-2016

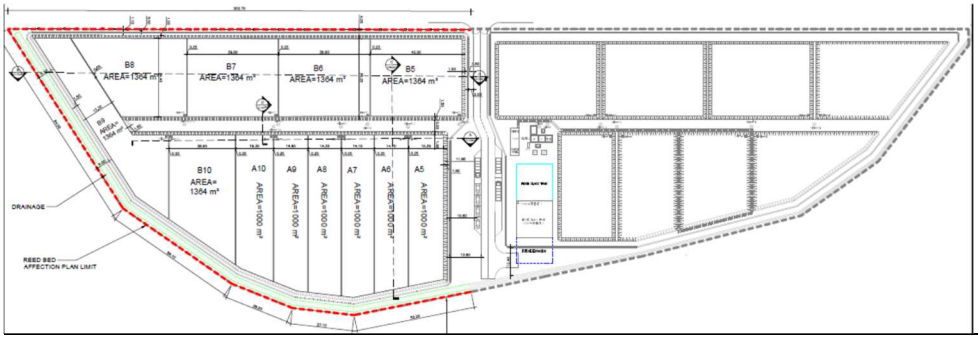
Pre-treatment:
- Tanker discharge station
- Basket screen
- Lifting pumps
- Rotor rakes

- Sludge Filtration & Mineralization
  Reed Bed Stage A
  (10 basins, vertical flow, 6 x 1000 m²)

Biological treatment step :
- Drainage pump station
- Reed Bed, vertical flow
  (4 basins, vertical flow, 6 x 1325 m²)

Outlet:
- 500 - 700 m³ of treated water per day.
- Direct reuse of the water for:
  Irrigation & Tanker filling

Space requirement total:
- 22.000 m²



	COD	BOD	NH4-N	PO4-P	TDS	TSS	DO	Turbidity
	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	NTU
Inflow								
TSE								
ADSSC P1	-	10	-	-	-	10	>1	5
ADSSC P3	-	50	2	2	-	50	>3	75

Mountain Wildlife Visitor Center, Kalba, Sharjah, U.A.E.

Client :
Government of Sharjah. H. H. Ruler's office

Contractor :
Main 'Contractor: Hardco
RBC, Reed Bed Contracting L.L.C.

Main Consultant:
URS, Mott Mac Donald (with support for planning and design by Blumberg engineers and Mizan Consult)
Population equivalent:
1000 visitors, 30 staff members, 30 m³/day

Planning: 2013-2014
Construction: 2015
Start: 12-2015

Pre-treatment:
- Lift Station
- Septic tank
- Grinder lift station

Biological treatment step :
- Vertical subsurface flow constructed wetland (2 basins, 2 x 300 m²)

Outlet:
- 20-30 m³ of treated water per day.
- Direct reuse of the water for: Irrigation

Space requirement total:
- 1.050 m²

Contract value:
- 1.09 Mio AED


Excavation septic tank

Installation of distribution pipes


Reed Bed under operation

	COD	BOD	NH4-N	PO4-P	TDS	TSS	DO	Turbidity
	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	NTU
Inflow	-	-	-	-		-		-
TSE	-	-	-	-		-		-
ADSSC P1	-	10	-	-	-	10	>1	5
ADSSC P3	-	50	2	2	-	50	>3	75

Dubai Creek Harbour, Wetland Recovery Center, U.A.E.

Client :
EMAAR, The Lagoons Phase One L.L.C.

Contractor :
RBC, Reed Bed Contracting L.L.C.

Main Consultant:
Mott Mac Donald

Population equivalent:
210,000 reed plnats

Planning: 2016
Construction: 2016-2017
Start: 03-2017

Pre-treatment:
- TSE Irrigated Nursery

Biological treatment step :

Outlet:
- 20-30 m³ TSE.
- Direct reuse of the water for:
  Road watering

Space requirement total:
- 11 x 312 m²

Contract value:
- 2.9 Mio AED

Excavation of reed plants

Nursery fresh potted reeds

Nursery after 4 month

	COD	BOD	NH4-N	PO4-P	TDS	TSS	DO	Turbidity
	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	NTU
Inflow	216	82	6.39'	47	2662	47'	4.7'	6.92'
TSE	-	-	-	-		-		-
ADSSC P1	-	10	-	-	-	10	>1	5
ADSSC P3	-	50	2	2	-	50	>3	75

TSE, used for irrigation of the nursery

Dubai Creek Harbour, Wetland Creation, U.A.E.

Client :
EMAAR, The Lagoons Phase One L.L.C.

Design & Build Contractor :
RBC, Reed Bed Contracting L.L.C.
Sievertconsult

Supervision Consultant:
Mott Mac Donald

Population equivalent:
100,000 m² wetland

Planning: 2016-2017
Construction: 2017-2018
Start: 10-2018

Pre-treatment:
- TSE from Municipality used for filling

Biological treatment step:
Area A 33,543m² surface flow wetland
Area B 20,015 m², pond with islands
Area C 46,442 m² planted submerged vertical gravel filter

Outlet:
- 2750 m³ TSE/day (Summer)
- 3250 m³ TSE/day (Winter)
- Direct reuse of the water for:
  Irrigation tank top up

Space requirement total:
- 100,000 m²

Contract value:
- 22.5 Mio AED

	COD	BOD	NH4-N	PO4-P	TDS	TSS	DO	Turbidity
	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	NTU
TSE-IN	216	82	6.39'	47	2662	47'	4.7'	6.92'
TSE-OUT	<40	<6	<5	< 3		<5		-

Haya Water, Pilot Reed Bed

Client :
Haya-Water, Oman

Contractor :
RBC, Reed Bed Contracting L.L.C.

Consultant:
Sievertconsult

Population equivalent:
220 PE

Planning: 2016
Construction: 2016
Start: 01-2017

Pre-treatment:
- Buffer tank
- Anoxic tank (25 m³)

Biological treatment step :

Stage A: 3 x 139 m² (417 m²)
Stage B: 2 x 312,5 m² (625 m²)

Outlet:
- 20 m³/day
- Reuse for irrigation

Space requirement total:
- 1300 m²

Contract value:
- 0,6 Mio AED

	COD	BOD	NH4-N	PO4-P	TDS	TSS	DO	VHO
	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	Oval/L
TSE-IN	974	330	59	11	1456	508	-	30
TSE-OUT	24	5	0,3	0,7	1730	2	6,4	0
MD 145/93 Standard A	150	15	5	30	1500	15	-	< 1

Sewage sludge mineralisation reed bed Wadi Hassan, Jordan

Client :
giz, Borda Water Authority of Jordan (WAJ)

Contractor :
Under tender

Layout plan

Capacity:
Wastewater per day 900 m³
50 m³/day surplus sludge with 3 %DS (1500 kg DM)

Planning: 2018
Construction: 2018/2019

Sewage treatment:
Extended aeration

- Aeration basin
- Settling tanks

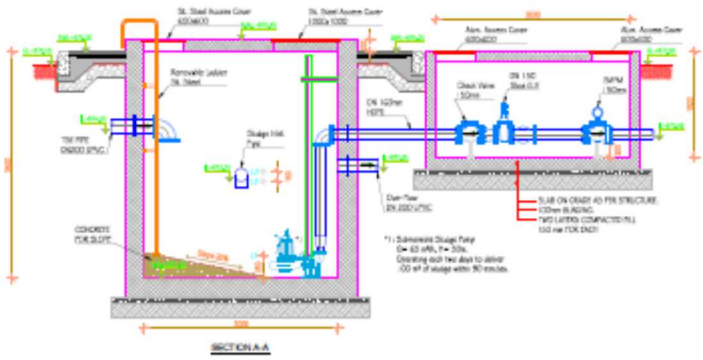
Sewage sludge treatment :
- Sludge thickener
- Sludge drying beds (summer operation)
- sludge mineralization reed beds (winter operation)

Load of sludge mineralization reed bed
- 6 month per year (winter)
- 70 kg DM /m²xyear
- 11.7 kg DM/month (operation in winter)
- Treated sewage irrigation during summer and start-up (40 m³/day)

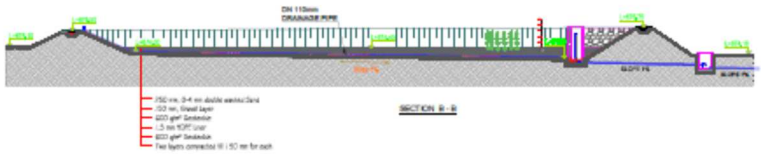
Output:
- Sludge liquor is pumped back to STP
- 686 m³ mineralized sludge per year accumulating in the basins, removal after 10 years.

Advantages:
- No liquid sludge handling, storage & disposal for 10 years
- No use of chemicals and energy only for pumping

Space requirement:
- 3,911 m² (reed bed surface)
- 9,238 m² (total area)



Distribution chamber



Section

Feynan Ecolodge, Reed Bed

(Decentralized Wastewater Management for Adaption to Climate Change in Jordan)

Client :
giz, Borda, Water Authority of Jordan (WAJ)

Contractor:
Shabatat Contracting

Consultant:
Ingenieurbüro Blumberg

Population equivalent:
5 m³/day

Planning: 2016
Construction: 2018
Start: 12-2018

Pre-treatment:
- Biogas-chamber for blackwater as primary Treatment (20 m³, 3 – 5 m³ Biogas per day)
- ABR (Anaerobic 'Baffled Reactor, 5 Chamber total 29 m³)

Biological treatment step :
- Solar lift station
- Syphon chamber
- Vertical flow constructed wetland: 2 x 75 m² (150 m²)
- Solar lift station to irrigation tank

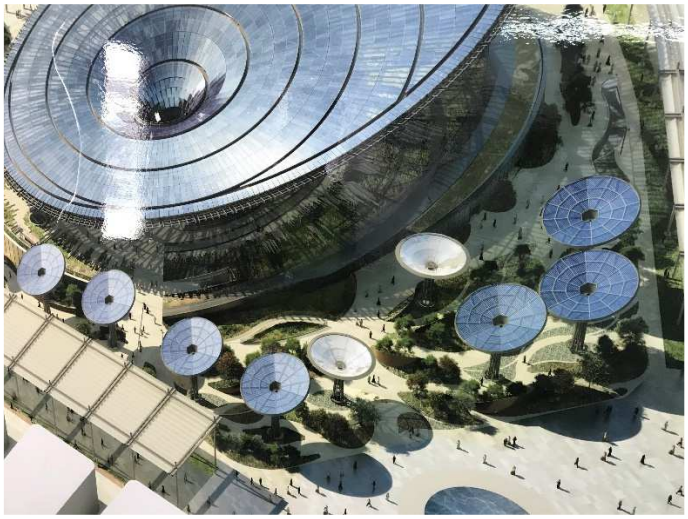
Outlet:
- 4 m³/day
- Reuse for irrigation

Space requirement total:
- 200 m²

	COD	BOD	NO_3	PO4-P	TDS	TSS	DO	VHO
	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	Oval/L
IN	527	305	53 (NH_4)	12	-	299	-	-
TSE-OUT	40	5	30	2	-	5	2	0
JS 893/2006 Category A	100	30	30	15	1500	50	-	< 0.1

Dubai Expo 2020

(Sustainable Pavilion, Water Management)



Client :
EMAAR

Main Contractor :
ASGC,

Design & build Contractor :
Reed Bed Contracting L.L.C. & Sievertconsult

Consultant:
Sherwood, Grimshaw

Waste Water:
55 m³/day black-Water (Reed bed & UF)
7 m³/day grey water (UF)
20 m³/day desalination of ground water (RO)
11 m³/day condensate (UF)
Evaporation pond for brine

Planning: 2019
Construction: 2019-2020
Start: 09-2020 (21)

Reuse:
- Black water for toilet flushing and irrigation
- Grey water for hand washing & ablution
- Condensate and groundwater for potable use

Biological treatment step:
- Black water: Reed Bed & aeration tanks

Mechanical treatment step:
- Black water: Ultrafiltration
- Grey water: Disk filter and Ultrafiltration
- Ground water: Filter & RO
- Condensate: Disk Filter and Ultrafiltration

Space requirement total:
- Black water: Settling tanks in landscaping 25 m³, Reed Beds 771 m² + 2 x 30 m³ aeration tanks, Ultrafiltration skid
- Grey water: 25 m³ buffer tank, Disk & UF-Skid
- Condensate: 25 m³ buffer tank, Metal removal and Adsorbtion Filter

Raw wastewater treatment by constructed wetlands in Al Azraq, Jordan

Employer:
BORDA Aman, Water Authority of Jordan (WAJ)

On behalf of:
Swiss Agency for Development and Cooperation (SDC)

Consultant:
Ingenieurbüro Blumberg (Blumberg Engineers)

Short description:
Two-stage wastewater treatment plant for a town in the Governorate of Zarqa

Population equivalent:
8358 PE
Daily loading rate:
515 m³/d

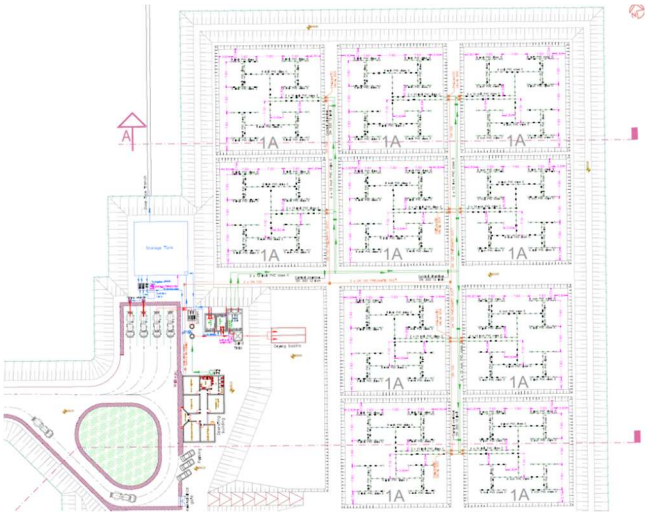
Project status:
Inception Phase: 11-2017 – 06-2018
Planning completed: 11-2019
Implementation Phase: 2020 - 2021

Pre-treatment:
- 2 tanker discharge stations
- 2 automatic bar screen (40 mm)

Stage A reed beds:
- Syphon: V = 30 m³, Q = 140 l/s
- 10 basins á 1,000 m²

Stage B reed beds:
- Pump station: V = 40 m³, Q = 32 l/s
- 8 basins á 1,000 m²

Effluent discharge reuse:
- Storage pond and reuse for irrigation and non potable reuse on site



	COD	BOD	NO_3	PO4-P	TDS	TSS	DO	VHO
	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	[mg/l]	Oval/L
IN								
TSE-OUT								
JS 893/2006 Category A	100	30	30	15	1500	50	-	< 0.1